IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title: **INSPECTION AND TESTING INDICATOR**

SPECIFICATION

BACKGROUND OF THE INVENTION

RELATED APPLICATIONS

This application claims the priority of Provisional Patent Application Serial No.60/414.880, filed October 01, 2002, the entire disclosure of which is expressly incorporated herein by reference.

FIELD OF THE INVENTION

It is a common practice for security personnel to inspect and test packages, purses, etc. for dangerous, illegal or hazardous items prior to persons entering secure areas, e.g., airports, public events, etc. It is also common for security personnel to inspect and test vehicles (automobiles) for hazardous materials.

This invention relates to simple, disposable stickers used by security personnel guarding a secure area, facility, or transportation vehicle to indicate that a person, package, or vehicle entering such secure areas has been inspected and is permitted to be therein.

Also, these simple, disposable stickers may be fabricated so as to perform trace analysis on the inspected article.

More specifically, this invention relates to a self-expiring inspection sticker that provides a positive, visible indication that the article or vehicle to which it is affixed has been inspected for weapons, contraband, etc.

This invention also relates to this type of adhesive sticker construction being used as a testing device, to test for explosives, narcotics, and other contraband items. These adhesive stickers may even be used to seal the article for a short period of time after inspection.

RELATED ART

Based on the specific location of a search, inspected articles, typically hand-carried articles, do not necessarily need to be tagged after input because the articles may be entering directly into a secure facility. However, in many facilities an inspection may be performed at one location in an insecure facility and the person must show that the article was inspected elsewhere in a secured facility. This requires an inspection sticker of some type for the inspected article. Also, these inspections of the people, packages, or vehicles may occur outside a facility, in a street or field where sophisticated equipment is not practical. Often it is desirable to secure the inspected article until some future time after inspection and this requires some type of sealing or wrapping band to go around the article.

In cases where a visual indicating device is used to show that the article was inspected, it is important that the inspection indicating device not be able to be used again. Traditionally, inspection devices, like visitor badges, solved such reuse problem by issuing the devices in a different color or serial numbers for each day. This required, for example, seven colors, one for each day of a week, or thirty-one colors, one for each day of the month.

In general, this solution to the reuse problem is unsatisfactory for a number of reasons: 1) the guards must be able to identify the particular color for that day, 2)inventory must be kept of the

various colors to prevent running out of a particular color, particularly because the number of devices used of each color can differ widely, 3) people can keep the different colors of the inspection devices and simply use the proper color anticipated for another day, and 4) the numbers or colors must be large enough to be easily seen from a distance.

More specifically, this invention solves the problem of identifying and verifying that a piece of carry-on luggage or a parcel has been inspected. In addition to tamper-indicating features, a visible self-expiration feature replaces the functionally of color coding, sequential numbering or date stamping, as well as preventing removal and reuse and eliminates the need for hardware or electronic systems.

SUMMARY OF THE INVENTION

In one embodiment, a time indicator is provided that provides a color indicia after a predetermined period of time has passed after activation. The time indicator includes a substrate, preferably a clear or transparent substrate, having an upper surface and a lower surface and a first portion and a second portion joined at a fold line. The first portion is of a smaller area than the second portion. An adhesive coats the upper surface of at least the second portion of the substrate. A first reactant is adhered to the upper surface of the first portion of the substrate and a second reactant is adhered to the upper surface of the second portion of the substrate. When the first portion is folded along the fold line so that the upper surfaces of the substrate contact each other, a portion of the adhesive on the second portion remains exposed. This exposed area may be used to attach the indicator to an article or documents. When so folded the first reactant and second reactant contact each other to activate the indicator and to provide the color indicia after the predetermined period of time after activation passes.

In another embodiment of the invention, the indicator is used to detect the presence of a chemical residue, e.g., explosive compound residues. The indicator comprises a substrate, preferably transparent, having an upper surface and a lower surface and a first portion and a second portion joined at a fold line, the first portion being smaller in area than the second portion. An adhesive coats the upper surface of at least the second portion of the substrate. A first reactant is adhered to the upper surface of the first portion of the substrate. When the second portion is contacted with a surface containing the chemical residue, e.g., the handle of a briefcase, the residue adheres to the adhesive. When the first portion is subsequently folded along the fold line so that the upper surfaces of the substrate contact each other, a portion of the adhesive on the second portion remains exposed. This exposed portion may be used to attach the indicator to an article, e.g., passport. The first reactant and chemical residue react with each other to provide the color indicia indicating the presence of the chemical residue.

DETAILED DESCRIPTION OF THE INVENTION

We will use the term inspection tags to mean pressure sensitive paper sticker products that are attached to articles to specifically indicate that the article has been inspected by an 'inspection person. The inventions described herein cover two functional types of one-piece inspection tags: a) inspection stickers to show that the article has been inspected, and b) testing stickers to show that the article does or does not contain a target substance such as explosives.

It is important that these stickers be one-piece because the human factors involved with the person performing the inspection are extremely important for the successful use of such a device. These inspection and testing stickers do not require any auxiliary hardware, power source, or batteries. A security person cannot be expected to assemble two or more components properly while standing in a field or on a roadway, and the person may not have a table or work surface for

such assembly. It is the one-piece, self-alignment, and color-changing construction of these inspection stickers that make the invention useful.

These unique adhesive stickers are constructed with the following properties:

One-piece pressure sensitive adhesive stickers that contain two chemically-independent reactive surfaces.

Pressure sensitive adhesive stickers where the two chemically- independent reactive surfaces are covered and protected from exposure to the environment and foreign matter before use.

Pressure sensitive adhesive stickers with a clear viewing window to observe any color change on either of the two reactive surfaces.

Pressure sensitive adhesive stickers where the two reactive surfaces can be brought into accurate alignment and contact with each other with the person employing only one hand.

Stickers constructed such that once the activation for timing or testing has been initiated, the sticker can be affixed to an the article or person inspected.

These labels are intended for use without other equipment or hardware. They are intended to be used by people in field operations(typically standing at remote locations) as well as at desk and inside facilities like airport concourses. What is more important, they are intended to be used by people who do not always have both hands available because of other tasks that they are performing. In an extreme case such as military situations, this may be while solders are holding their weapon with one hand. Thus, the simplicity of the operational process is an important factory in the invention of this sticker.

An inspection can be for any of a variety of purposes; custom regulated items, security items, contraband items, or excluded items like liquor, etc. Even though the inspection tags of this

invention can be used incertain situations to seal the inspected article, this is not its primary purpose. The inspection stickers are intended to be attached to an inspected article or document. After a period of time, such as one day, the inspection sticker will change color or show words like 'VOID' to prevent the stickers from being usable in the future.

The testing stickers are intended to be used to sample the article for traces of specific substance such as explosives, narcotics, etc. Upon activating the sticker, a color change will occur if traces of the substance are detected. The chemical technologies employed in these color-changing time-stickers and the color-changing testing stickers are well known.

Referring to commonly used self-expiring security badges employing the Visually Change Paper technology, each VCP security badge consists of two separate parts, a pressure sensitive adhesive display front part and a migrating ink back part. When the adhesive front part is adhesive attached to the back part, the adhesive dissolves the migrating ink, the ink diffuses into the front part, and the front part changes color.

The present invention is a new construction which performs the same function as these two part badges, except it is a single unit construction. An inspected article means the object being inspected, such as a briefcase, a purse, and/or package. For definition purposes, these inspection stickers contain an indicator area on the inspection sticker or device that indicates a valid or void state of the inspection. Generally, this is an area on the device that is printed with a migrating ink or other chemical agents.

The time dependant color-changing process or function employed in all of the embodiments described herein is a well-known technology. In particular, the technology and products are described and claimed, for example, in the following US Patents: 5,364,132;

5,446,705; 5,602,804; 5,715,215; 5,873,606; 5,719,828; 5,785,354; 5,822,280; 5,930,206; and 5,957,458. The entire disclosures of these patents are incorporated herein by reference.

The products described and claimed in these patents have become universally accepted as the means for controlling and improving visitor security and temporary badges. These products are generally self-expiring visitor badges, which simply change color, and show an expired indicia after the predetermined authorization time has lapsed. The inspection sticker or inspection device of this invention is designed to have specific properties in order to be functional for the officers and security officials using them. They must be 1) easy to use, 2) tamper indicating, 3) ensure a useful life intended for the inspected duration, and 4) be low cost.

The self-expiring inspection tags of this invention eliminate the reuse problem associated with prior known devices because they change color after a predetermined time interval to prevent reuse of the devices. Because the device is permanently rendered void, its reuse is impossible. Further, because it cannot be used the next day, only one color of the product is required so that the inventory control of this single item is much simpler and more cost effective than non expiring devices. The self-expiring inspection indicator of this invention is secure, meaning that it cannot be removed from an article and reapplied to another article. Additionally, the indicator cannot be left on an article and used at another time. Additionally, the indicator may be made so that it is tamper indicting, i.e., an attempt to remove the indicator is obvious to one observing the indicator after it has been tampered with. Surfaces covered with pressure sensitive adhesives can be made tamper indicating and resistant to removal by a variety of conventional means.

The self-expiring inspection sticker is comprised of two separate components which we will call the adhesive part and display part. The display part has a migrating ink printed thereon and the adhesive part has an exposed adhesive surface. Whereas the two components are co-planar, they

are laterally displaced and not in contact with each other. When used, the adhesive part is folded over so as to be exactly be positioned parallel to the display part, and it is then pressed onto the display surface to make intimate contact with the migrating ink. This is typically done with the fingers. This initiates the timed color-changing process by placing the migrating dye in contact with the diffusing adhesive material.

With the substrate of the sticker being a clear plastic material like 0.001" or 0.002" polyester, people can view the indicating surface through the exposed side of the sticker. With the remaining exposed adhesive surfaces, the sticker can be attached to the article that was just inspected, or it could be attached to some document of the owner of the article. After a period of time the adhesive contact with the migrating ink causes the display part to change color or show VOID words.

These constructions of the self-expiring inspection sticker of this invention are a one-part construction and performs the same functions as the two part construction. However, the inspection stickers (tags) o f this invention can be of any size or shape. Broadly, a one-piece sticker has a first portion of the top surface covered with an adhesive and a second portion of the top surface covered with migrating ink. When the migrating ink portion of the sticker is folded over to contact the portion of the top surface covered with adhesive, the time function is activated. Subsequent thereto the remaining uncovered adhesive portion is used to attach the sticker to the inspected article. After the predetermined period of time the migrating ink bleeds to indicate expiration. Many variations of adhesive/migrating ink configurations may be used as long as the self-expiring inspection sticker is one piece with a foldable portion that activates the time function.

In another embodiment, the sticker is used for the detection of a contaminant substance, for example, explosives, drugs, poisons, etc. Such a sticker is, in effect, being used as a testing device.

The inspector removes the sticker from its protective liner (typically silicone coated paper) and samples the suspect article by touching the adhesive portion (the adhesive part) to the surface of the article. This can be done repeatedly and the inspectors fingers can be used to press from the rear the adhesive surface of the sticker onto the sampling surface. These stickers are typically about 2" or 3" long in order to have enough surface area for the fingers to apply pressure. In trace explosives detection, some of the surface absorption and top surface contamination will remain attached to the adhesive of the sticker. The adhesive of these stickers will typically have organics captured in the adhesive itself, so this will assist with the transfer of the substances to the adhesive surface.

This single sticker is also comprised of two separate components, adhesive part and display part. The display part has one or more chemical agents printed thereon and the adhesive part has an exposed adhesive surface. Whereas the two components are co-planar, they are laterally displaced and not in contact with each other. When used, the display part component is folded over so as to be exactly positioned parallel to the adhesive part component, and it is then pressed onto the back part adhesive surface. This is typically done with the fingers. This initiates the chemical reaction process by placing the chemical agents in contact with the adhesive material which contains the trace explosive (substance)material.

With the substrate of the sticker being a clear plastic material like 0.001" or 0.002" polyester, people can view the indicating surface through the exposed side of the sticker. The chemical reaction and color change may occur in a matter of seconds, so the inspector can determine very quickly if the article has been exposed to explosive materials or contamination. With the remaining exposed adhesive surfaces, the sticker can be attached to the article that was just inspected, or it could be attached to some document of the owner of the article.

Whereas the configuration of the testing sticker can be a variety of forms such as those shown as the T-tag configuration, the rectangular configuration, and others, each configuration possesses the four specific functional components required in the testing function. These four functional components are the adhesive sampling surface, the color-forming reactant surface, the fold-over activation (and alignment)property, and the clear viewing window property.

Depending on whichever configuration is used, the sticker can provide the very important (additional) property of attaching the testing sticker to the article or to documents associated with the article. Since the testing sticker will provide verification results of the security or analytical test, it is important to be able to associate the specific testing sticker with a particular article. Many color forming reactants have been published in the patent literature. For our description here, we shall just list a sample of those specific for explosives trace detection. These reactants can be applied as discrete circles or squares on the testing sticker reactant surface or as discrete bands along the testing sticker reactant surface. Bands of reactant are preferred along the testing surface because bands of chemicals can be applied continuously from solution during the production process. From the functional point of view, bands will provide a larger area for detecting explosives on the adhesive samples surface. A sample explosive that does not cover the entire sampling surface could very well miss a circle of reactant when the adhesive sampling surface if folded over on the reactant surface.

An example of a detection system that could be used in this invention is described in US Patent 5,296,380 to ***Margalit***, the entire disclosure of which is incorporated herein by reference. Thus, for example, to detect nitroaromatic explosives, the first reagent band could be an alkaline resin containing an diazotizable amino aromatic azo-dye precursor; for detecting organic nitrates and nitramines, the second reagent could be an acidic resin containing nitrate to nitrite ion reducing

agent and a diazo-coupler; for detecting inorganic nitrates, the third resin could be a resin containing zinc powder; for detecting chlorates and bromates, the fourth reagent could be an acidic resin with inorganic nitrates and an aniline salt. ***Margalit*** states that these four color detection reagents provide an excellent system for examining the sample of explosives for detection.

Another example of a detection system that could be used in this invention is described in US Patent 4,788,039 to ***Glattstein***, the entire disclosure of which is incorporated herein by reference. Thus, for example, the adhesive sampling layer can include a solvent such as dimethylsulfoxide and a coating of tetra-alkyl ammonium or phosphonium hydroxide on the reactant surface. ***Glattstein*** states that this change accelerates the elimination reaction of nitrate esters, producing the preferred nitrate ions which can be readily detected by a second reagent that produces the well-known Griess reaction to produce a colored azo dye. This dye color change can be viewed on the reaction surface through the clear support film which acts as the viewing window. ***Glattstein*** also states that nitroamines undergo alkaline cleavage to form nitrite ions, which produce the same colored azo compound by the Griess reaction. Likewise, polynigroaromatics form lightly colored (violet-dark) compounds upon reaction with this reaction. Thus, this provides a multi-reagent test kit for the presumptive identification of traces of explosives.

The shape and construction of the inspection tags are shown in the **Figures 1-14.**

Fig. 1 shows the preferred construction of the indicator or tag **20**. The components of the tag **20** are shown in schematic in **Fig. 2**.

Referring to **Figs. 1** and **2,** the indicator **20** comprises a clear substrate **50** which forms the facestock for the web assembly **10**. Substrate **50** may, for example be polyester film with thickness of 1 to 10 mils. The substrate **50** is clear so that the color change caused by reactant **53** can be viewed. Printing may be applied to the front of the substrate **50.** Such printing could be instructions

such as *fold-over* or *fold-here*. Other printing could provide identification to the user of the inspection tag and would add security to prevent counterfeiting or substituting another sticker in its place.

Referring to **Fig. 1** and **3,** web **10** could be die-cut into a plurality of indicators **20.** The indicators could be of any shape that is convenient to the user, e.g., rectangular, round, or the preferred **T** shape as shown in the **Figures** herein. The **T** shape permits the reactant display surface **30** to be easily folded over onto the adhesive sampling surface **40**. By this construction, the display surface **26, 30** sticks to the central adhesive portion of the adhesive sampling surface **40** of the T shaped indicator **20,** while leaving both ends of adhesive sampling surface **40** exposed for attaching the indicator **20** to the inspected article or the documents associated therewith.

Referring to **Fig. 2**, on the underside of the clear substrate **50** is a clear adhesive **51** which may have various organics mixed within the adhesive to form the solvent for the color forming reactions. The adhesive coating **51** covers the entire surface of substrate **50** and is protected from the environment by the silicone coating **54** on the release paper **55** This is a well known means of construction for pressure sensitive film materials. Printing, such as instructions, can be applied to the rear surface of the release liner **55**.

Referring to **Fig. 2**, attached to the adhesive layer **51** and sandwiched between the facestock **50** and the release liner **55** is the display surface **52** with the color forming reactants on the surface in contact with the silicone liner **54**. The color forming chemicals or reactants can be printed as a uniform coating **53** on the display surface **52** or they can be applied in patterns or bands. In any case, the display surface **52** is normally non-porous so as not to absorb or permit any of the organic liquids in the adhesive **51** on the clear substrate **50** to penetrate therethrough.

In one embodiment, when using the indicator **20** to test for reactants, one lifts the die-cut sticker **20** off the release liner **54, 55**, contacts the adhesive **51** and reactant **53** several times to a surface to be tested, e.g., luggage handle, to get a sample of any residue. Referring to **Fig. 3**, the display surface or flap **26** is then folded onto the opposing adhesive **40** to initiate the reaction and color change process. (See **Fig. 4**)

The indicator **20,** as shown in its activated form in **Fig. 4**, is attached to the inspected article or related documents by adhering the adhesive area **21** not covered by flap **26** to the article. One can then see through the flap **30** through window **26** the change in color from, for example, indicia **28** in **Fig. 4** indicating non-void to a void indicia **22** in **Fig. 5.**

As shown in **Fig.3**, the clear substrate **50** of the web becomes the viewing window **26** on the inspection sticker**20** and carries a sample of the substance that was collected from the inspected article as well as the organic compounds and constituents for facilitating the reagent reactions on the display face **53** and provides adhesive **51** for the attachment extensions **21**on the sides of the sticker.

In the self-expiring inspection sticker shown in **Fig. 4**, the display face is printed with a hidden pattern of migrating ink **28** and background printing. With colored dyes mixed with dark pigments like carbon black, the mezzo-tint pattern or patterned array of the inks. No words or distinctive colors are shown to alert the inspection personnel. After a period of time, the dyes diffuse laterally into the white spaces of the display area so that color changes or words will appear. **Fig. 5** shows the display area **22** with alert words the void indicia *VOID* in distinctive colors. This self-voiding property of these inspection stickers make them valuable for security of the inspection process.

Fig. 6 shows these inspection stickers die-cut in a different shape such as a rectangle. In this case, the web **60** is constructed exactly as shown in **Fig. 1** with the display material **52** sandwiched between the adhesive face stock **51** and the silicone liner **54**.(see **Fig. 2).** The display material **62** is laid along one edge of the rectangular web **60** and leaves a portion of the clear adhesive facestock **62** exposed.

As shown in **Fig. 7,** the sampling for substances on articles is performed by touching the adhesive **64** to the surface of the article. The display area **64** is then folded over to initiate the color reactions or color timing sequence for time indicators.

Fig. 8, shows the mezzo-tint pattern **67** while the exposed adhesive **65** is used to attach the sticker to the inspected article. After a period of time, as shown in **Fig. 9**, a VOID indicia **69** appears.

Depending on the application, the color forming chemicals can be applied to the display surface in a variety of ways. They can be uniformly mixed into one coating or ink mixture and applied as a solid print onto the display surface. They can be printed as a pattern or text. As shown in **Fig. 10**, color forming reactants can also be applied in discrete areas so that each circle of reactant determines a specific substance or explosive. For example, the circles **93** on flap **92** could each contain reactants for different explosives and in this construction, the inspection tag would sample for 9 different explosives and show which type of explosive it is. When folded over, as shown in **Fig. 11**, the viewer looks at the array of circles **94** and their color change on the inspection tag, he would determine the type of explosive present by the position of the particular color circle. Likewise in **Fig. 12**, the color reactants have been applied as continuous bands along the display area. The relative position of the bands that change color would indicate the specific substance detected.

Whereas we have shown inspection stickers which are a single unit and simply fold over for activation, it is possible to construct inspection stickers of several parts which perform the same function. A cross-sectional view of this type construction is shown in **Fig. 13** where two materials have been attached together and the structure is activated in a similar manner of folding over a portion of the structure to bring the adhesive sampling area into contact with the color forming reactant display area.

It is also possible for construct these inspection stickers with more complicated separators. For example, in **Fig. 13, 14,** the separator between the adhesive sampling surface and the color forming reactants is in the form of a pull tab separator **98**. The inspector exposes the adhesive surface by removing the separator **98**, contacts the adhesive to sample the article surface for substances and then folds the adhesive back onto the color forming reactant display area.

While various changes may be made in the detailed construction and processes of this invention, it will be understood that such changes will be within the spirit and scope of the present invention. Having thus described the invention in detail, it is to be understood that the foregoing description is not intended to limit the spirit and scope thereof. What is desired to be protected by Letters Patent is set forth in the appended claims.